

SEP 14 2001

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4 McDONALD WRENN: I have spent the whole of
5 last weekend reading the preliminary site
6 evaluation study and analyzed what would happen if
7 the engineered safeguards were not taken credit
8 for, as per the recommendation of the APS study a
9 quarter century ago.

10 The graph reproduced here is from the APS
11 study and shows the ingestion hazard of the LWR
12 wastes without reprocessing expressed as volume of
13 water required to reduce the activity to the water
14 concentration limits as per 10 CFR 20. I have also
15 put on the horizontal axis.

16 The transport time required for the first
17 waste to arrive in Amargosa Valley, as taken from
18 the PSES. I have only included transport time
19 through the unsaturated zone followed by the time
20 to travel laterally through the saturated zone
21 including alluvium to a receptor 18 miles down
22 gradient (the underground hydrologic equivalent of
23 downstream).

24 I also read the "Saturated zone
25 radionuclide transport model," 1997. The time to

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1 breakthrough fractions in the unsaturated zone is
2 1,000 to 10,000 years. I chose 1,000. And the
3 transport time laterally through the saturated zone
4 is 1300 years. This total transport time through
5 the unsaturated and saturated zone give a decay of
6 10^{23} which is sufficient to reduce the important
7 fission products Sr-90 and Cs-137 to trivial levels.

8 However, in the long-term the actinide
9 precursors (isotopes of Pu, Cm, Am and U) and of
10 Ra-226 will decay into Ra-226 and produce a low
11 level contamination of groundwater in part of the
12 Death Valley basin which would lead to doses from
13 water ingestion equal to two to three percent of
14 the natural background total effective dose
15 equivalent to about 360 mrem/yr (background-natural
16 background). This peak occurs well into the future
17 100,000 to 1 million years after emplacement.

18 The report states that the groundwater in
19 the region is confined within the closed Death
20 Valley Basin and escapes only through evaporation
21 or plant transpiration. No surface or groundwater
22 flows out of the basin. This is good news and bad

23 news. The good part is that other aquifers,
24 including the surficial Colorado River, cannot be
25 contaminated.

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1 The bad news is that the Death Valley
2 aquifer will be beginning after 10,000 years more
3 or less permanently contaminated, but the doses
4 resulting from that are a small fraction of natural
5 background and equal roughly to the variation in
6 natural background from moving to a home 1,000 feet
7 higher or taking one transcontinental airplane
8 flight, or even moving down to the street or from
9 one town to another. Substantial populations live
10 in high natural radiation background areas in India
11 and Brazil where the backgrounds exceed 10x those
12 normal for the rest of the world without any
13 apparent harm.

14 This aquifer contamination could be
15 significantly reduced by co-locating a fuel
16 reprocessing plant and mixed oxide fuel fabrication
17 plant and burning the fissionable actinides in
18 power reactors. The justification would be Pu
19 destruction and disarmament, with the permanent

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20 destruction of about 23 kg of Pu-239 per Gwe-yr,
21 enough possibly to make several small nuclear
22 weapons. This would also have the effect of
23 expanding the fissile lwr fuel supply by 150
24 percent, although it would likely not be as
25 economical as mining and enriching natural
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1 uranium. Experience in France under IAEA
2 supervision has shown such operations can be
3 carried out safely without diversion of Pu to
4 unapproved uses.

5 French scientists say that lwr power
6 reactor produced Pu is not weapons grade anyway.
7 The large 100 plus U.S. power reactor network could
8 be used to destroy as much Pu as necessary, but the
9 recycle fuel would probably have to be a government
10 program and co-located at the NTS. Recycle could
11 reduce the Ra-226 in wastes by a factor of 6
12 (p.s110, APS, TABLE 7B1) thus international
13 safeguards could be expedited at great speed and
14 significant contamination of the Death Valley
15 aquifer avoided.

16 The period of retrievability planned is

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17 100 years so that the current repository could
18 proceed as designed while plans for reprocessing
19 and recycle fuel fabrication were developed.
20 Senator Ensign, your political leadership is needed
21 here to overcome the legal, political,
22 institutional and financial impediments. Perhaps
23 you can enlist the cooperation of Senator Reid. If
24 you can pull off the political end, perhaps there
25 is a Noble Peace Prize at the end. Good luck. You
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1 will have many scientists and engineers behind
2 you. Let's destroy plutonium not bury it. There
3 will be a great deal of international support for
4 your effort.
5 In short, I believe the proposed
6 repository design is safe but could be made safer
7 by adding a co-located reprocessing plus mixed
8 oxide fuel fabrication plant to allow destruction
9 of Pu in nuclear power production and hence reduce
10 the longer lived contaminants added to the Death
11 Valley Basin aquifer.

12 Basis of hydrological transport time of
13 1,000 years used for my evaluation of holdup during

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14 transport through the saturated zone down gradient
15 to the Amargosa Valley. The "Saturated zone
16 radionuclide transport model," 1977 which states
17 that: Transport times to a hypothetical 5 km
18 compliance point are on the order of a few thousand
19 years, therefore my use of 1,000 years for
20 transport to 18 km, the nearest point of exposure
21 to groundwater, is very conservative, (i.e., a
22 gross underestimate).

23 Short physics lesson: When a shorter
24 lived radionuclide decays into a longer lived
25 radionuclide, such as Pu-238 into U-234, the
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1 radioactivity of the daughter decreases at least in
2 proportion to their respective half lives, but of
3 course the longer lived daughter is more
4 persistent, i.e., sticks around longer.